San Joaquin River Riparian Habitat Restoration Program

2000 Pilot Project: Riparian Restoration Flows for the San Joaquin River between Gravelly Ford and Mendota Pool

Monitoring and Coordination Plan

1. Introduction

The San Joaquin River Riparian Habitat Restoration Program (SJRRHRP) is a collaborative effort of the Friant Water Users Authority (FWUA), the Natural Resources Defense Council (NRDC), the Pacific Coast Federation of Fishermen's Associations (PCFFA), the U.S. Bureau of Reclamation (USBR), and the U.S. Fish and Wildlife Service (USFWS), with the purpose of improving riverine and riparian conditions along the San Joaquin River. In 1999, a pilot project was initiated to augment flows in the river for promoting dispersal and germination of seed from riparian tree species, and to test the hypothesis that managed flow releases from Friant Dam can be used to restore riparian vegetation that will survive over the long-term. To guide decision making and to quantify the impact of these augmented flows, data were collected on physical and biological variables by different groups including the California Department of Water Resources (DWR), FWUA, Jones & Stokes, Mussetter Engineering Inc. (MEI), and the Natural Heritage Institute. For 2000, another pilot project (2000 Pilot Project) is planned by the SJRRHRP, pending availability of funding, to manage flows from Friant Dam to promote recruitment of riparian tree species and to calibrate and refine hyrodrologic modeling efforts..

In February, 2000, the U.S. Geological Survey (USGS) reviewed the 1999 pilot release program and provided suggestions for designing a monitoring scheme that integrated physical and biological variables (Scott et al. 2000). This integration should increase monitoring efficiency and focus data collection on variables most important for evaluating the degree of success of riparian restoration objectives. The suggested approach and procedures should also assure that monitoring results may guide future adjustments to flow magnitude, timing, and duration. At a pilot project planning workshop held on March 8-9, 2000 at the Fresno office of USBR, the results of the 1999 monitoring and the monitoring scheme proposed by Scott et al. (2000) were discussed by stakeholders, consultants, and government representatives.

A proposed monitoring plan for the 2000 Pilot Project is presented in this document. It draws on the suggestions made in the Scott et al. (2000) report and results from the pilot project planning workshop. A brief rationale for each monitoring component is presented, followed by a description of the methods to be used and a preliminary recommendation of individuals or groups that might be responsible for completing the work. Criteria for recommendations included level of expertise and experience, efficiency (by minimizing the number of people collecting data), consistency, and continuity. Approximate person-hours required to complete each monitoring task are presented in Table 1. Recommended monitoring frequencies for each task are given in Table 2.

2. Evaluate Timing of Seed Release for Target Riparian Tree Species

2.1. Rationale

To determine the best timing of flow releases beneficial for seed dispersal, seed-release periods of target riparian tree species must be better understood. Knowledge of seed-release periods for the target species would provide an understanding of optimal timing of flow releases and the degree of flexibility for initiating augmented flows. Tree species composition may also be manipulated by shifting peak flow releases, if seed-release periods of the species differ.

2.2. Methods

Trees to be evaluated for seed release should be representative of trees in the lower San Joaquin River below Friant Dam, yet close to access points to minimize travel time. Given the sampling frequency necessary, all data collection per sampling event should be less than a day.

Potential locations where trees could be conveniently monitored include :

- Lost Lake,
- Herndon Road, east of Highway 99,
- Dickenson Road,
- Skaggs Bridge,
- Napa Road, and
- San Mateo Road.

A total of 10–15 trees of each of two main target species, Fremont cottonwood (*Populus fremontii)*, and Goodding's black willow *(Salix gooddingii*) will be chosen at the sampling locations listed above. These two species are the most abundant riparian trees in Reaches 1 and 2. In addition, where possible and convenient, a few representative trees of three other species present along the river: narrow-leaved or sandbar willow (*Salix exigua*), red willow (*Salix laevigata*), and arroyo willow (*Salix lasiolepis*) will also be chosen. Trees to be sampled will be widely spaced to avoid including genetically related trees. Initial selection of trees should be done at or after the time of flowering to ensure that only female trees are included. If too few female trees of each species are within easy access at each location, fewer trees will be sampled at more locations. We will attempt to sample trees at sites where access is not an issue. Landowner consent will need to be obtained if data collection requires the use of private roads, access across private lands, or access to private levees.

Tree position will be mapped using a global positioning system (GPS), marked using a numbered metal tag permanently attached to the tree with an aluminum nail, and flagged using highly visible tape. At the time of the first visit, several additional variables will be measured, such as distance of the tree to landmarks and to the active river channel, elevation in relation to the river channel, and size (diameter at 1.5 meters [m] above the ground). These additional data will allow the trees to be relocated in subsequent visits if the permanent markers are vandalized or removed and can be used for analysis of environmental causes of variability in seed-release times.

Amount of ripe seed and pappus ("cotton") present on each tree will be estimated according to the following scale:

0 = no cotton present,
1 = small proportion of seeds are ripe (1–10%),
2 = moderate proportion of seeds are ripe (10–75%), and
3 = large proportion of seeds are ripe (75–100%).

In 1999, it was noted that some trees contained large amounts of cotton even late in the summer. This seed was generally not actively dispersed, as it appeared to be trapped by sticky aphid honeydew and spider webs. Branches should be shaken gently to determine whether the seed is easily dislodged and could be dispersed.

For each tree, 5–10 random catkins will also be examined, either with binoculars or with the naked eye, to estimate the number of capsules that have opened. Percentage of open capsules will be scored according to the following scale:

0 = no capsules open,
1 = 1–10% of capsules open,
2 = 11–50% of capsules open,
3 = 51–90% of capsules open, and
4 = >90% of capsules open.

It is not known what will be most closely related to the amount of seed present in the river system: the overall amount of cotton present or the percent of capsules open on catkins. Evaluating the amount of cotton present should take less than one minute per tree, while estimating the percent of open capsules will likely require less than five minutes per tree. The time required to take both measurements is much less than the driving time necessary to reach each sampling location. In subsequent years, scoring both variables may not be necessary.

At each sampling location the presence of seed cotton in the air and on the water surface (if water is present in the channel) should also be recorded.

Data should be collected every ten days during the main seed-release period from April 1 until the end of July. Data should be collected once in both August and September. Data collection should end when no more seed that can be released remains on the sampled trees.

2.3. Suggested Responsible Parties

Data collection requires an understanding of riparian tree ecology. The number of observers should be minimized to enhance scoring consistency. It is recommended that Marcia Wolfe (FWUA) supervise the seed-release data collection. Due to the need for frequent data collection, she will probably need to hire an assistant who would make most observations. To ensure consistency and high quality data, this assistant should be trained and supervised by Marcia Wolfe.

3. Install 15 Permanent Transects

3.1. Rationale

Scott et al. (2000) proposed installing a set of permanent transects perpendicular to the channel and extending across the floodway on both sides of the channel. Physical and biological variables would be collected along these transects in an integrated format, to facilitate interpreting the relationships between surface- and groundwater hydrology, channel hydraulics, and vegetation establishment and survival. In addition, repeated measurements of water surface elevation and discharge at these transects will provide valuable data for calibrating existing hydrological models, and synoptic gagings will permit existing loss curves to be better defined. Scott et al. (2000) suggested installing a minimum of 15 transects, 12 in Reach 2 (between Gravelly Ford and Mendota Pool) and three in Reach 1 (between Friant Dam and Gravelly Ford). The monitoring effort would be focused on Reach 2, because of the greater historic loss of riparian vegetation in Reach 2 relative to Reach 1 (Jones & Stokes Associates 1998).

3.2. Methods

Transects should be located to use existing wells, piezometors, and vegetation transects. Where possible, transects should be located on state-owned land or on land owned by cooperative individuals. This preliminary site selection should be based on USBR maps. In addition, transects should be selected to represent a range of sites in proportion to geomorphic environments present in the river channel (e.g., point bars, braided channels and bars).

A schematic illustration of the components of each monitoring transect is presented in Figure 1. Each endpoint of the transects will be monumented with at least three 5-foot long pieces of one-half inch diameter "rebar" to provide redundancy for reestablishment of the monuments should there be losses due to erosion or vandalism. The location of these monuments will be established with survey-grade GPS equipment and will be tied to the NAVD 88 datum. A consistent system of river miles (e.g., modified from the USBR atlas) and a coordinate system (e.g., state plane) should be agreed on prior to the establishment of the transects, and these systems should be used consistently throughout the 2000 Pilot Project and in any subsequent monitoring.

One shallow observation well should be installed per transect. Wells will consist of a hand-driven sand point on 2-inch galvanized pipe and will be driven to a depth of 3–5 m below the channel thalweg. Wells should be located on higher elevation bars within the active river channel and approximately 7 m upstream (or downstream) from the centerline of each transect. At most sites, the active river channel would be defined as the area wetted by an approximately 2,000 cfs flow. Locations and elevations of the well(s) should be tied to the transect monuments. Installing wells slightly outside of the transect is preferable, to prevent trampling of seedlings when the wells are measured.

The new sand-point wells, plus existing wells and piezometers should provide information on groundwater elevation that will lead to a better understanding of patterns of subsurface flow at the transects. Transect setup should proceed as soon as funding becomes available and water levels drop to appropriate levels. Target dates are early to mid-April.

3.3. Suggested Responsible Parties

Transect selection and setup is crucial for the success of the monitoring effort. It is suggested that USGS, MEI, and Jones & Stokes cooperate on selecting and installing transects. USGS should oversee the installation of sand-point wells, due to their experience with these measurements (Scott et al. 1999, Shafroth et al. 2000). Surveying transect endpoints should ideally be done in association with the surveying of channel cross sections at each transect (below). We suggest that MEI staff, who have already completed extensive surveying of the river channel and have experience setting up permanent survey monuments, direct this aspect of transect setup. Since the choice of transect locations is so critical for interpreting all data to be obtained, the technical team involved in last year's monitoring should provide consultation on locating transects, including Doug DeFlitch (FWUA), Marcia Wolfe (FWUA), Peter Vorster (Bay Institute), and John Cain (Natural Heritage Institute).

4. Monitor Physical and Biological Response Variables

4.1. Physical Response Variables

4.1.1. Rationale

The purpose of monitoring physical response variables is to record channel geometry and flow conditions. In addition, these measurements quantify effects of variable flow releases below Friant Dam on physical parameters that may be important to the establishment of riparian vegetation. Because different life stages of riparian vegetation respond to the magnitude of flows at different times of the year, it is imperative that some physical data (e.g., stage, flow, groundwater level) be collected frequently. In this way, responses of riparian vegetation can be correlated to the timing and magnitude of flows or the absence of flow continuity.

4.1.2. Methods

4.1.2.1. Channel cross-section geometry. A detailed survey of the channel should be performed between the end point monuments at all transects during the initial transect installation. This baseline survey should be supplemented with a second survey at the same location after high flows have ceased (midsummer, in coordination with the vegetation survey), to determine whether flows have modified channel geometry. The initial survey should be more intensive, including additional cross sections surveyed up to two to three channel widths upstream and downstream in order to create a fine-scale local topographic map of the sampling area. This will permit future extrapolation of vegetation data based on identifiable geomorphic features.

4.1.2.2. Water surface elevation. Water surface elevation should be determined relative to the surveyed transect end point monuments using a total station theodolite. These measurements should be made each month at all transect locations and supplemented with measurements provided by automated gages at Friant Dam and Gravelly Ford.

4.1.2.3. Discharge. Discharge measurements and water surface elevation measurements are necessary to develop stage-discharge relationships for each transect and loss curves for Reach 1 and Reach 2. Actual river discharge should be measured using standard USGS methods: measurements of water depth and flow velocity (evaluated using a flow meter) at intervals across the river channel. Obtaining these measurements will require a boat at high flow conditions but can be done by wading across the channel in low-flow conditions. All discharge measurements will be tied to the local and vertical control (monuments) so that the water surface elevations can be used for hydraulic model calibration, and flow depths can be used to evaluate changes in channel geometry.

Discharge should be evaluated at three of the transect locations: between Friant Dam and Gravelly Ford, downstream from Gravelly Ford near RM 224, and at approximately RM 219. USBR gage data could potentially be substituted for discharge measurements at the most upstream location. Measurements should be made under a range of flow conditions: once at the peak pilot flow discharge, once during the receding limb, and once at maintenance flow conditions in late summer. Synoptic discharge measurements should be made at the different locations to provide data for refining loss curves. These measurements might require multiple crews during periods when river flow is changing rapidly, or a single crew over a period of one to two days during periods where releases from Friant Dam are stable. For practicality, the synoptic gaging will have to be conducted when the river is wadeable. Difference in discharge should be computed between each transect where flows are measured and in relation to flows recorded at permanent stream gages (Friant, Gravelly Ford, and below the Chowchilla Bypass).

4.1.2.4. Shallow groundwater. Riparian trees are dependent on subsurface moisture; therefore, depth to the groundwater during different seasons is an important component to understanding patterns of and limitations to vegetation establishment and survival. Elevation of the water table should be recorded monthly using the sand-point wells installed adjacent to each transect. Elevation of the water table should be simultaneously recorded at each of the existing wells drilled during 1999 at five locations within Reaches 1 and 2. These measurements should be taken monthly at the time when water surface elevation is measured. More frequent measurements may be desired during periods of rapid change in stage/discharge.

4.1.2.5. Nonintrusive remote stratigraphic measurements. This component is optional but could provide potentially informative quantification of the presence and depth of sand and clay layers, as well as insight into patterns of subsurface flow. This information could be gained using shallow-reflection seismic surveys, resistivity surveys, or ground-penetrating radar surveys. Ideally, measurements made using one of these techniques should be taken at each of the transect locations including the transects where the existing wells are located. Existing well logs should be used to provide verification and calibration data for the remote methods. The Department of Geology at Fresno State University has the necessary equipment and expertise, and faculty and students of the department should be involved to make these measurements.

Such surveys should optimally be conducted late in the season, when water in the river channel is at its lowest level or not present.

4.1.2.6. Bed material composition. Size of sediments within the riverbed should be evaluated one time either prior to augmented flows or after flows have ceased. A sample of bed material should be obtained from mid-channel in the middle of the closest riffle to each transect. Collecting material from within the same geomorphic feature is important so that temporal and spatial changes in bed material can be assessed. Additional bar material samples should also be collected at each of the transects where vegetation becomes established to determine the gradations of the plant establishment substrates. Material from these samples should be separated into size classes using standard gradation analyses with screens of different sizes.

4.1.3. Suggested Responsible Parties

It is suggested that MEI and USGS should be responsible for measuring cross-section geometry. It is recommended that Doug DeFlitch (FWUA) be responsible for groundwater, discharge, and water surface elevation measurements. Doug was responsible for groundwater measurements for the 1999 Pilot Project and would provide continuity and high quality data collection. Doug would need to supervise several assistants to be able to conduct all measurements in a timely manner.

4.2. Biological Response Variables

4.2.1. Rationale

Seedling establishment and seedling and sapling survival are the main biological variables that should be monitored. The purpose of monitoring seedlings and saplings is to quantify vegetation response to flow releases and other conditions affecting germination and survival. Information gained on vegetation establishment patterns in relation to physical and hydrological variables should provide insight into processes that limit riparian tree establishment and growth in this section of the San Joaquin River and should guide the adaptive management of flow releases for best restoring riparian tree species.

4.2.2. Methods

Belt transects centered on the transect should be used to sample woody vegetation establishment and survival (Figure 1). A tag line marked in 1 m increments should be placed across the permanent rebar transect endpoints. Using this tag line, a 5-m-wide belt (2.5 m on each side of the tag line) should be evaluated for presence of riparian tree seedlings and saplings. A 1- by 5-m rectangle created by stringing together two 1-m-long pieces of PVC pipe with an appropriate length of rope should be centered on the tag line and moved along this line from one end of the transect to the other at 1-m increments. If tree seedlings and saplings are encountered within the rectangle, their location should be recorded by distance along the transect (Figure 1). Vegetation in each band or patch along the transect should be scored using the following size/age classes:

1. current year germinants,
2. seedlings > 1 year but less than 2 m in height, and
3. saplings > 2 m in height.

Within each size/age class, presence or absence of the different riparian tree species will be noted. Cover of riparian tree species will be roughly estimated using the Daubenmire cover classification system (1 = 0-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, and 6 = 95-100%). The density of live stems of each species will be estimated based on the following scale:

0 = none present,
1 = <1 stem/m^2,
2 = 1–5 stems/m^2,
3 = 6–20 stems/m^2,
4 = 21–100 stems/m^2, and
5 = >100 stems/ m^2.

Overall health of the seedlings, occurrence of significant mortality, and apparent cause of mortality (desiccation, herbivory, etc.) will also be noted.

Vegetation composition should be monitored three times in 2000. The first evaluation will occur in April when the permanent transects are installed. This evaluation will provide baseline data on vegetation present prior to the augmented flows. A second evaluation will occur in late July or early August (about 6 weeks after germination of seed at the higher water elevations), and a final evaluation will occur in late October or early November, at the end of the growing season but prior to leaf drop. The first or baseline evaluation is less critical than the second and third. This first evaluation will, however, provide important data on the presence, abundance, and species composition of seedlings already growing within the transect boundaries.

By re-sampling transects, riparian tree mortality would be represented by a loss or reduction in patch area and a reduction in stem density over time. Tree growth would be represented by a change in the size/age class of a patch over time. Mortality corresponding with a drop in the groundwater with no flood-related change in channel cross-sectional geometry would provide evidence for insufficient base flows (***Hypothesis 1, Scott et al. 2000***). The failure to record seedling establishment at or immediately below the stage of a gradually receding peak flow would provide evidence for insufficient seed availability (***Hypothesis 2, Scott et al. 2000***). Mortality following a flood-related change in channel cross-sectional geometry would provide evidence for removal by scouring (***Hypothesis 3, Scott et al. 2000***). The failure to record seedling establishment at or immediately below the stage of a rapidly receding peak flow, occurring within the seed dispersal period, would provide evidence for desiccation mortality resulting from a rapidly declining recession limb (***Hypothesis 4, Scott et al. 2000***).

4.2.3. Low-level aerial photography. To gain a broader perspective of vegetation establishment patterns outside of the transect locations, low-level color infrared photographs at a scale of approximately 1:10,000 should be flown annually at the end of summer. Vegetation can be identified on the color infrared aerial photographs. The vegetation data derived from the photographs should facilitate analysis of the hydraulic impact of the vegetation (see Section 5 below). If infrared photographs cannot provide the necessary resolution, the river channel between Gravelly Ford and the backwaters of Mendota Pool should be walked in late October or early November, noting the general area covered by riparian tree seedlings on all sandbars. This information will be drawn on copies of 1999 aerial photographs of the river channel.

4.2.4. Suggested Responsible Parties

To take advantage of expertise with monitoring vegetation in riparian systems, a team of USGS and Eric Knapp (Jones & Stokes) is recommended. USGS should participate in the initial monitoring visit and should be available for consultation throughout the monitoring period.

5. Modeling Effects of Established Vegetation on Future Flood Conveyance

5.1. Rationale

Restoring vegetation in the San Joaquin River channel could potentially impact hydraulic roughness and flood conveyance capacity if trees become established over large areas. Under this task, future roughness values that would result from the seedlings established in 1999 and 200 will be estimated. The purpose of including estimates of increased channel roughness in hydrological models is to determine how seedlings established by the pilot flows in 2000 might potentially impact channel flow capacity and levee stability.

5.2. Methods

A map of position and abundance of newly germinated riparian tree vegetation relative to measured cross sections will be created in the fall of 2000. Using similar methods as developed for the Mussetter and Jones & Stokes (2000) report on evaluating roughness effects of increased vegetation associated with the 1999 Pilot Project flow releases, roughness projections will be developed for vegetated polygons in Reach 2 between Gravelly Ford and Mendota Pool. Three roughness projections will be based on predicted vegetation size and extent in 2002, 2010, and 2020. Growth projections developed for Goodding's black willow in Mussetter and Jones & Stokes (2000) will be used.

If vegetation is established across a range of channel elevations within a cross section, mortality projections will be developed that include the expectation of increased mortality due to channel scour in future high flows at lower channel elevations. The hydraulic roughness effects of the projected increase in vegetation associated with the 2000 Pilot Project flow releases will then be incorporated into the baseline conditions model by modifying the channel roughness in the new vegetation zones but keeping all other model parameters the same. Differences in model results for each vegetation age-class scenario from the baseline conditions model will represent the effects of the new vegetation.

5.3. Suggested Responsible Parties

This analysis is nearly identical in process to one already completed by MEI and Jones & Stokes. In order to maximize efficiency, this team should conduct the analysis for pilot project 2000.

6. Monitoring Coordination and Data Distribution

6.1. Rationale

Interests of stakeholders would be best met if all monitoring data and analyses are made available in a timely and efficient manner. Rapid availability of monitoring results will allow informed management decisions, including decisions about flow releases and about monitoring activities. For example, information about seed release could help guide the timing of releases aimed at seed dispersal. If unforeseen circumstances arise that necessitate adjustments of the monitoring procedure, effective communication of those circumstances and monitoring results would making those adjustments easier. To maximize the benefit of the data collection and avoid negative consequences of unforeseen circumstances, a data coordinator should be assigned. In addition, multiple individuals and groups may be collecting data, and coordination of the monitoring activities should ensure that data collection methods are consistent.

6.2. Methods

Coordination of data collection and distribution involves two components: coordination of monitoring activities, and data entry and distribution. The data coordinator should be responsible for coordination and distribution of the data. Two recommended tools for the distribution of data and analysis results are e-mail and an internet site where files can be retrieved through file transfer protocol (ftp) using a browser (e.g., Netscape or Internet Explorer) or other software. The internet site could be password protected to ensure the confidentiality of the data. The distribution lists for raw data, summaries and internet passwords should be approved by the SJRRHRP program manager.

6.2.1. Coordination of Monitoring Activities

A schedule should be designed prior to the start of monitoring that includes the timing of all monitoring activities. This schedule should be available to all interested parties. It should be the responsibility of the data coordinator to make the schedule available through e-mail and the internet site. As monitoring crews or individuals need to modify the monitoring schedule, they should notify the data coordinator, who will then update the schedule. Availability of the schedule to all interested parties will ensure that all parties are aware when data will be collected and allow adjustment to the schedule or monitoring activities.

6.2.2. Data Entry and Distribution

Prior to the onset of monitoring, data sheets should be designed for use in the field. These data sheets should be reviewed by experts involved in the Pilot Program. The data coordinator should make the data sheets (Excel spreadsheets) available in electronic form via email and on the internet site.

As soon as possible after collection, data should be submitted to the data coordinator either in electronic form or by fax. The data coordinator should be responsible for the entry of data that was received by fax and should review all data to ensure completeness and proper formats. The data should then be summarized using simple spreadsheet operations. A brief report summarizing the quantitative results (including summary tables and graphs) should be made available to all appropriate parties via email. If necessary to accommodate software or hardware limitations of the recipient, the data coordinator should fax data summaries to appropriate parties. The raw data and summaries should be posted on the internet site as soon as they are available, and periodic updates on the status of data collection and data entry should be sent to all appropriate parties.

6.2.3 Recommended Responsible Parties

The data coordinator should have expertise in data collection, data management, analysis, and synthesis and have staff available for data entry. The data coordinator should also have information technology staff available and have access to high quality state-of-the-art internet tools. In addition, the data coordinator should be familiar with the objectives of the Pilot Program and the needs of the stakeholders. Dr. Eric Knapp, plant ecologist with Jones & Stokes, is recommended for the data coordinator role. Jones & Stokes can provide all support necessary for the data coordination tasks.

7. Data Analysis and Reporting

7.1. Rationale

An important purpose of collecting monitoring data for the 2000 Pilot Project is to learn how augmented flows from Friant Dam can most effectively be used to restore riparian vegetation along the San Joaquin River. Careful analysis is required to draw scientifically defensible conclusions from the monitoring data. This analysis should employ rigorous statistical tools and should be informed by a thorough understanding of the current status of the ecology of riparian vegetation.

The monitoring results need to be reported to the agency that provides funding to the project. In addition, the results of the monitoring should be reported to a broader audience of scientists and the public. Publication of scientifically defensible conclusions would greatly benefit the 2000 Pilot Program. Publication in a respected, peer-reviewed scientific journal will lend scientific credibility to the project and may aid to reduce public controversy. Other riparian vegetation restoration efforts would also benefit from the publication of the monitoring results.

Publication of scientifically defensible conclusions from the pilot program to a broad public audience would also greatly benefit the program.

7.2. Methods

The specific variables to be compared in the analyses and the statistical test to be used should be determined prior to monitoring. The monitoring data should be periodically reviewed by a riparian ecologist, a hydrologist, and a geomorphologist, to ensure that the data is being collected according to expectations. After the seedling survey in November, all data should be transmitted to a team responsible for analysis and publication of the monitoring results. This team should conduct an analysis of the data as quickly as feasible and report the results to all appropriate parties. Data analysis and interpretation should be coordinated with the technical representatives of the FWUA and NRDC and by the SJRRHRP management team.

Analysis results, interpretation, and conclusions should be incorporated into a report to the funding agency. A manuscript should be prepared and submitted to a peer-reviewed scientific journal. Prior to submission, any manuscripts should be reviewed by the stakeholders and the SJRRHRP management team. Simultaneously, analysis results and their interpretation should be provided to stakeholder representatives for release to the public.

7.3. Recommended Responsible Parties

Drs. Mike Scott, Pat Shafroth, and Greg Auble, riparian ecologists with USGS, would be exceptionally qualified for the development of appropriate data analysis methods and for statistical analysis of the monitoring data. Members of the USGS team have a proven track record of publication in the peer-reviewed scientific literature, and are widely recognized as leaders in the field of riparian ecology. Data analysis should be closely coordinated with the assigned data coordinator described in the previous section. To maintain continuity with previous years' efforts, it is recommended that USGS coordinate analysis and publication with Marcia Wolfe, John Cain, Peter Vorster, Steve Chainey and Dr. Eric Knapp (Jones & Stokes), and Drs. Mike Harvey and Bob Mussetter (MEI). It is recommended that some combination of these parties should also be responsible for communicating the analysis results to the stakeholders and the SJRRHRP management team.

8. References

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